

## GREENING ANTARCTICA

One would not expect to find fresh vegetables growing in total darkness at  $-100^{\circ}\text{F}$ . Yet at the new Amundsen-Scott South Pole Station that's just what's happening. Larger than the United States and covered in ice, on average two miles thick, Antarctica is a vast frozen continent and the South Pole marks its center. Six months of the year the South Pole is locked in darkness, and traffic to and from is impossible due to the extreme cold. Even so, since 1957 people have made the South Pole their home over the dark Austral winter.

This winter 64 people live and work at the South Pole inside the brand new Amundsen-Scott South Pole Station. Living along side them within the station and inside a 2,800-cubic-foot growth chamber, are a variety of fresh vegetables – lettuce, tomatoes, cucumbers, peppers, cantaloupe – along with herbs and edible flowers. The University of Arizona's Controlled Environment Agriculture Program (UA-CEAC) in combination with Sadler Machine Company, Tempe, Ariz., designed and constructed the new South Pole Food Growth Chamber (SPFGC). Its semi-robotic disposition includes its automated hydroponic nutrient injection, a climate-controlled environment, atmospheric carbon dioxide enrichment, and remote monitoring and adjustment capability via Internet Web cameras and an ARGUS Controls computer control system. Supplying it with light are 13 water-cooled, high intensity discharge lamps designed for NASA. This state-of-



Lane Patterson, shown here harvesting cucumbers at the North Pole, is a recent graduate from the UA Agriculture and Biosystems Engineering Department who participated in the design, construction, and testing of the SPFGC. He is employed by Raytheon Polar Services Corp. and is working as a CEA technician at the McMurdo Research Station and the Amundsen-Scott South Pole Station. He is currently "wintering-over" while completing a masters of science degree in ag and biosystems engineering at UA with a focus on CEA.

the-art growth chamber, called the "greenhouse" by station personnel, provides fresh salads every day for lunch and dinner and cantaloupe for breakfast when the melons are ripe and available. In addition to the fresh fruit and vegetables, the chamber provides a green space where bright light and high humidity can be experienced by the crew.

Although the greenhouse, like the sauna, gym, and TV lounge, makes the frozen life more livable, Patterson finds his thoughts often turn toward home in North America.

"Three short months lie between me and leaving Antarctica for the last time. I'll take with me the memory of joining the 300 Club – a club one joins by running around the axis of our planet at  $-100^{\circ}\text{F}$  just prior to relaxing in a sauna set at  $200^{\circ}\text{F}$ . I will remember assisting scientists, during my off hours, with the repair and conversion of an old communications satellite dish to a SETI radio telescope capable of scanning the southern hemisphere for evidence of extraterrestrial life. I won't forget the many volunteers who, with their consistent help in the greenhouse, made me feel like Tom Sawyer painting the fence. Nor will I forget the days when it was too cold for machines to work outside and so, in their place, all 64 of us made a line in the snow and moved the week's food from cold storage to the kitchen in a bucket brigade fashion," says Patterson.

The remote location, hazardous environment, and isolation are just a few of the similarities between the current South Pole station and any lunar or Mars bases built in the future. Such bases will require ecological life-support systems, and the South Pole Food Growth Chamber has the potential to explore some of the logistics associated with the way station crew members benefit from and manage such systems.

As a grad student at the UA Agriculture and Biosystems Engineering Department and the current winter operator of the growth chamber, Patterson says the focus of his thesis (ecological life support systems for space applications) will include data collected during his stay in "one of the most hostile environments on earth, while growing vegetables for some of the coolest people on our planet — for sure, an awesome experience!"

Others may soon have this opportunity, as an internship program has been developed within the CEAC at UA. Studying controlled environment agriculture (CEA) can take you to distant places ... extremely distant and different places!

Interested students or recent graduates should contact Dr. Gene Giacomelli at [giacomel@ag.arizona.edu](mailto:giacomel@ag.arizona.edu) for more information.